TABLE 6.—*Lowest minimum temperatures (°F.) 1901 to 1923, at Williamstown, Mass.*

	June	July	Aug.
1901	44	48	[3] 56
1902	41	47	44
1903	38	43	42
1904	41	44	[1] 35
1905	38	47	42
1906	38	48	46
1907	38	45	43
1908	37	48	40
1909	43	43	42
1910	37	49	43
1911	45	49	44
1912	[1] 35	[1] 41	[2] 38
1913	[2] 35	44	41
1914	42	47	45
1915	38	48	40
1916	40	47	46
1917	[3] 48	[3] 50	46
1918	37	[2] 42	42
1919	42	48	45
1920	38	44	44
1921	38	[3] 50	44
1922	43	47	45
1923	42	46	[2] 38
Average	39.9	46.3	43.1

[1] Lowest average. [2] Next lowest average. [3] Highest average.

TABLE 7.—*The departure from normal of the various months of 1816 (°F.)*

	January	February	March	April	May	June	July
Cambridge	+5.0	−0.6	−4.1	−2.5	−4.5	−6.0	−6.5
New Bedford	−2.2	+1.6	−1.9	−1.4	−2.5	−5.0	−5.8
New Haven	−4.0	0.0	−4.0	−5.0	−5.0	−7.0	−7.0
Salem	−0.4	+0.3	−4.7	−0.7	−3.0	−5.4	−5.7
Williamstown	−1.5	+4.0	+0.6	+0.7	−1.4	−3.2	−3.8
Do	−0.8	+2.5	−2.3	−1.0	−3.8	−5.2	−5.4

	August	September	October	November	December	Year	Normal based on—
Cambridge	−3.2	−4.8	−0.1	+3.5	−2.3	−2.2	----------
New Bedford	−2.2	−3.3	+0.8	+2.6	+2.0	−1.4	1813–1856
New Haven	−2.0	−5.0	−1.0	+2.0	0.0	−3.0	1778–1920
Salem	−1.6	+0.5	−1.6	+1.7	+1.8	−1.5	1786–1828
Williamstown	−2.0	−3.4	+1.4	+0.6	+2.3	−0.5	1816–1819
Do	−2.1	−3.9	+1.5	+3.6	+2.0	−1.3	1816–1838

TABLE 8.—*The departure from normal of the months of various years at Williamstown, Mass., °F.*

	January	February	March	April	May	June	July	August	September	October	November	December	Year
1816	−0.8	+2.5	−2.3	−1.0	−3.8	−5.2	−5.4	−2.1	−3.9	+1.5	+3.6	+2.0	−1.3
1817	−1.0	−7.6	−3.0	+0.1	−2.3	−6.4	−2.6	−0.5	−0.2	−1.8	+2.7	+1.3	−1.8
1835	−1.6	−2.8	−1.7	−1.4	−1.8	−1.3	−1.4	−0.9	−4.0	+4.6	+0.4	−5.5	−1.5
1836	+1.0	−7.0	−5.5	−3.3	−0.7	−3.6	−0.2	−5.3	+0.1	−6.4	−3.3	−2.1	−3.0
1837	−8.5	−1.1	−3.3	−3.3	−4.7	−2.6	−3.5	−2.1	−2.4	−2.4	−0.3	−1.1	−3.9
1838	+7.4	−9.6	+1.4	−5.8	−2.6	+2.5	+2.2	−0.6	+0.2	−3.0	−4.6	−7.0	−1.6
1912	−7.6	−2.4	−4.3	+0.2	+1.5	−1.6	+0.6	−1.6	−0.1	+0.8	+2.3	+6.6	−0.4
1913	+11.4	+0.4	+5.3	+2.5	−1.5	+1.0	+0.1	+1.1	−1.8	+3.9	+4.9	+3.9	+2.6

TABLE 9.—*Solar constant values and Wolfer, 1920–1924*

	January	February	March	April	May	June	July	August	September	October	November	December	Year
1920	1.964	1.956	1.946	1.952	1.953	1.939	1.945	1.930	1.942	1.943	1.949	1.955	1.948
1921	1.958	1.951	1.946	1.947	1.949	1.934	1.945	1.936	1.944	1.947	1.954	1.951	1.947
1922	1.945	1.946	1.934	1.927	1.927	1.917	1.911	1.917	1.903	1.918	1.919	1.927	1.924
1923	1.926	1.915	1.913	1.913	1.915	1.916	1.926	1.931	1.933	1.930	1.931	1.923	1.923
1924	1.930	1.919	1.916	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

WOLFER SUN-SPOT NUMBERS, 1920–1924

1920	57.3	50.9	71.9	14.3	33.7	38.8	26.5	18.6	38.7	48.8	24.6	39.9	38.7
1921	28.8	27.6	27.5	30.5	22.3	34.5	42.4	20.8	16.7	16.1	13.4	15.7	24.7
1922	10.2	27.9	60.0	11.4	7.7	5.8	9.7	5.3	5.2	8.1	6.7	18.7	14.7
1923	5.3	1.6	4.0	5.4	3.2	9.0	3.7	0.5	13.7	11.5	7.3	1.1	5.5
1924	0.7	5.7	2.2	11.5	20.7	24.8	-----	-----	-----	-----	-----	-----	-----

A NEW CLASSIFICATION OF TYPHOONS OF THE FAR EAST [1]

551.515 (5-012)

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INTRODUCTION

Cyclonic storms have often played a part in the history of nations. The wreck of the Spanish Armada in 1588 is probably the best-known illustration. In the east, there is a singular parallel in the complete demolition of the Mongolian fleet by a typhoon in the early summer of 1281, during Kublai Khan's invasion of Japan. The immediate cause of this expedition was the execution of Kublai's ambassador by the Japanese emperor in the spring of 1280. The next year, Kublai sent an army of 100,000 men, who embarked in 3,500 ships, to undertake the subjugation of Japan. On July 17, 1281,[2] just at the beginning of the typhoon season, a violent tropical storm came up which sank most of the ships of the grand fleet, then anchored off the coast of Kiushiu Island. Of the 100,000 men on board the ships, only 3 returned to China alive.

In most recent times, all the far Eastern countries have paid heavy tolls to these terrible scourges. During the Cantabria cyclone of September, 1905, hundreds of thousands of dollars' worth of property was destroyed in southern Luzon and in the Visayas, and more than 140 people were killed. In the typhoon of September 7–12, 1904, 4,000 persons were killed in Hué, the capital of Annam. A storm wave caused by the Shanghai cyclone of 1905 overwhelmed the island of Tsun-Ming off the coast of Shanghai, and several thousand persons were drowned. A great flood accompanying the typhoon of August 7–11, 1910, killed more than 1,200 people in Japan. More recently, the Swatow typhoon of August 2, 1922, brought calamities to the region around Swatow; more than 5,000 people were killed or drowned in Swatow alone.

Before considering the characteristics and habits of typhoons, it is necessary to define what is meant by "typhoon." Algué has described a typhoon as a vast whirl of aerial currents which surround a central calm space of relatively small dimensions called the "vortex," or center of the storm. The central region of calm, relative or absolute, is, however, only found in the better-developed tropical cyclones. In the reports of the Zikawei Observatory, practically all the tropical storms are called typhoons. Because of the diversity in the use of the word, a clear distinction between a typhoon and a mere depression, based upon the intensity of the storm, has to be made.

The barometric readings do not indicate the intensity of a cylcone, for this intensity depends upon the rate of

[1] Acknowledgments.—With a few alterations this paper was written in 1918 to fulfill part of the requirement for the degree of Ph. D. in Harvard University, Cambridge, Mass. Since then, quite a few papers have been written on the subject of the typhoons of the Far East, the most notable being Father Louis Froc's Atlas of the Tracks of 620 Typhoons 1893–1918, published by Zikawei observatory, Shanghai. In view of the new light thrown upon the subject by the recent papers, additional footnotes have been inserted wherever occasion demands. The subject of this thesis was chosen mainly because of the economic importance of typhoons in the Far East. The writer has also an added interest because of the fact that he is a native of a region on the coast of China which is visited by those storms. The material used in this report has largely been obtained from the annual and monthly meteorological reports of the Zikawei Observatory (Bulletin des Observations), the Journal of the Meteorological Society of Japan, the annual reports of the Central Meteorological Observatory of Japan, and especially from the monthly bulletin of the Philippines Weather Bureau; without these publications this investigation would not have been possible. It has been the privilege of the writer to carry out his work under the supervision of Prof. Robert DeCourcy Ward, to whose advice, encouragement, and helpful suggestions the writer takes this opportunity to express his sincere thanks.

[2] The Chinese date for this memorable event is the first day of the seventh month in the eighteenth year of Chi-Yuen, Juen dynasty. In western chronology, this is July 17, 1281 (according to Rev. P. Hoang's Concordance des Chronologies neomeniques, Chinoise et Européenne, Shanghai, 1910, p. 269.) In this connection, attention may be called to an interesting book written by a Japanese author, N. Yamada, The Mongol Invasion of Japan, published in London in 1916.

the decrease of pressure, and not on the absolute minimum pressure. Owing, however, to the scarcity of data as to the pressure gradient, a classification of typhoons according to gradients is not practical. On the other hand, the data concerning wind velocity are abundant, and the wind velocity furnishes a good criterion of the violence of a storm. For these reasons, the present writer has used the recorded wind velocities as the basis of his grouping of typhoons and of ordinary depressions.

The tropical storms of the Far East have been divided into three classes: (1) Typhoons of the first order, or class A, in which a wind velocity of Beaufort scale 12 was registered. Practically all typhoons of a destructive nature are accompanied by winds of hurricane force. (2) Typhoons of the second order, or class B, in which a wind velocity of Beaufort scale 6 was registered. (3) Depressions which are feebly developed, have ill-defined centers, and may be called tropical storms.

Any such scheme of classification is necessarily arbitrary, for no clean-cut lines can be drawn between typhoons and mere depressions. Besides, the wind velocities are usually estimated by the observers, and hence the personal error is unavoidable. Owing to the fact, however, that storms have been called typhoons in one report, and depressions in another, it is necessary to have some standard in order to settle such cases. Under the circumstances, wind velocity seems to be the only feasible basis that can be used in distinguishing tropical storms of varying intensity.

There is another class of storms often called typhoons which needs a word of comment. This group includes storms which originate between latitude 20°–25° N. and longitude 120°–130° E., passing over Loochoo Island, and thence move to Japan or to the Pacific. These occur mostly in winter and spring, and originate in too high a latitude for typical tropical storms. Their course is always eastward, and lacks the first branch of the usual parabolic curve, which is an earmark of a tropical cyclone. In the following Table 1 the storms of this group which occurred in the years 1904–1915 have been enumerated by months and their seasonal distribution is compared with those of typhoons and of continental depressions. The similarity with the latter class is quite obvious.

TABLE 1.—*Seasonal distribution of typhoons and of continental depressions*

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Typhoons	3	1	6	4	11	13	39	51	46	36	22	15	247
Continental depressions	38	32	45	60	56	48	20	8	14	27	31	33	412
Storms originating near Loochoo	7	8	5	5	7	4	0	0	1	5	2	2	46

Typhoon tracks are usually parabolic in shape. They vary, however, both in form and in geographical location. Such variations are not haphazard, but are according to certain more or less definite rules. Before any inquiry into these rules can be undertaken, it is necessary to subdivide typhoon tracks into different classes.

This classification has the merit of being simple, and in a scheme of this sort, simplicity is always of prime importance. As our practical interest in typhoons concerns mainly the damage done in the region which is affected by the violent wind, or by the cyclonic wave which accompanies the storm, this classification has the additional advantage of being comprehensive. Each type of typhoon has its own sphere of influence. The devastation, caused by a certain class of storm will, if we except the damage done to steamers at sea, be limited to the region whose name that class of storm bears.

HISTORICAL REVIEW OF TYPHOON CLASSIFICATIONS

Father F. S. Chevalier, S. J., in his pamphlet, The Typhoons of the Year 1893, classified typhoons according to the countries which they visit, and divided them into three groups, viz, typhoons of China, typhoons of Japan, and typhoons of Cochin China. He deemed it unnecessary to make the typhoons of the Philippines a separate group, as they were either typhoons of China or of Cochin China. The typhoons of Japan were subdivided into (1) those which originated east of the Philippines and recurved near the south of Formosa, and (2) those which originated further to the east, and recurved before reaching either the Philippines or Formosa. The typhoons of the first division come early or late in the season, in the months of May, June, or October, while the typhoons of the second division occur in the midseason. Among the typhoons of Cochin China, Father Chevalier[3] distinguished the typhoons of the Gulf of Tonking and the typhoons of Annam. The latter type occurs in the months of November and December, while the former type comes in the same season as the Japanese typhoons which recurve in the neighborhood of Formosa. Father Chevalier subdivided the typhoons of China into (1) those which move onto the land southwest of Hongkong, (2) those which reach land between Hongkong and Foochow, and (3) those which pass inland near the mouth of the Yangtze River. Of the typhoons of this last type, Father Chevalier said that they do not appear before the middle of July, or after the middle of September.

The Chevalier classification is, however, not without its defects, for it is incomplete. Father José Algué, S. J., has pointed out in The Cyclones of the Far East[4] that the conclusion that the typhoons of the Philippines must belong either to the Chinese or Cochin China group is erroneous. This argument is based upon two concrete examples. As will be seen later, such storms as those referred to by Father Algué are not rare, especially in the months of October, November, and December. Besides the typhoons of the Philippines there is another group of storms which Father Chevalier has failed to place in a separate class, viz, those of the Pacific. These storms often recurve before reaching longitude 130° E., and thence travel along the second branch of their parabolic path far to the south of Japan. These should, therefore, not be classified as the typhoons of Japan.

Dr. W. Doberck, formerly director of the Hongkong Observatory, in his The Law of Storms in the Eastern Seas[5] suggested the grouping of typhoons into four classes according to the path which they usually follow. He did not explicitly name each of his classes, but from his description of these different types, they may be roughly summed up as (1) typhoons of the Gulf of Tonking, (2) typhoons of China, (3) typhoons of Japan and the Pacific Ocean, and (4) typhoons of the Philippines, south of Luzon. No subdivisions of any of these classes were suggested. Later, in 1898, Dr. Doberck revised his classification, basing the revision on 244 typhoons observed during the 13 years 1886–1898.

[3] F. S. Chevalier, S. J., 2d annual report to the Shanghai Meteorological Society for the year 1893, chap. 4, p. 89. Shanghai, 1894.
[4] José Algué, S. J. Cyclones of the Far East, p. 89. Manila, 1904.
[5] W. Doberck, The Law of Storms in the Eastern Seas, Shanghai, 1887, p. 31. Chinese Imperial Maritime Customs, Special Series 1167.

TABLE 2.—*Doberck's classification of typhoons*

Type	Origin	Path, general description	Season	Per cent
1a	China Sea north of lat. 15° N.	Enter continent west of Hongkong.	June-Sept.	10
1a'	Pacific	Enter China Sea and continent west of Hongkong.	July-Oct.	12
1b	do	Enter China Sea north of lat. 15° N. and disappear to the southwest.	Late in the year	2
1c	China Sea	Enter continent east of Hongkong.	June-Sept.	4
1d	do	Recurve and sometimes move into the Pacific.	May-Sept.	2
2a	Pacific	Enter China Sea and China east of Hongkong.	July-Sept.	2
2b	do	Enter Formosa and hence south China.	June-Sept.	7
2c	do	Enter China north of Formosa.	June-Sept.	3
2d	Pacific, high latitude.	Enter China	July-Aug.	4
3a	Pacific	Enter Luzon and recurve.	Oct.-Nov.	1½
3b	do	Enter Formosa and recurve to Japan.	October	1
3c	do	Enter Korea	July-Sept.	4
3d	do	Recurve and enter Japan	Aug.-Sept.	15
3e	do	Remain in the Pacific	May-Dec.	12½
4a	China Sea south of lat. 15° N.	Enter Hainan and Annam	May-Dec.; seldom in Aug.	8½
4a'	Pacific	Enter China Sea south of lat. 15° N. and hence go to Annam.	Beginning and end of typhoon season.	3
4b	do	Enter China Sea south of lat. 15° N., move to southwest and disappear.	Sept.-Dec.	4½
4c	do	Recurve in the China Sea and reenter the Pacific.	Beginning and end of typhoon season.	4
4d	(?)	Gulf of Siam	April and Dec.	1

The four original groups were retained, but each group was subdivided into four or five types, making 19 types in all. (See Table 2.) Group 1 comprises all the typhoons that enter the China Sea north of latitude 15° N. Group 2 includes all the typhoons of China originating in the Pacific. Group 3 includes all the typhoons of Korea, Japan, and the Pacific, and also some of the Philippines. The storms of this group are similar to those of group 1 except that they enter the China Sea south of latitude 15° N. Each group is represented by an Arabic numeral, while the subdivisions are denoted by letters.

Doberck's classification has the advantage of being very definite. The origin of each class of typhoon is roughly indicated, and each class is very narrowly and distinctly limited. Thus, if typhoons are classified according to Father Chevalier's method many cases are on the border line between two or more types, and hence may be classified under more than one heading. Such cases are rare if Doberck's scheme is used.

The clear distinction possible in Doberck's classification is, however, gained at the expense of simplicity. Unless one has a thorough knowledge of the classification, it is not easy to remember just what a particular combination of numerals and letters stands for. Neither numerals nor letters have any very sharply defined meanings. Furthermore, the subdivisions of the groups are not always homogeneous, and they are often inconsistent. Take, for instance, the typhoons of group 3. Those of types 3b, 3c, 3d, and 3e all have immediate or remote effects upon Japan, but those of type 3a belong to a much lower latitude, and have nothing in common with the storms of the other types in the same group, save that all of them recurve before reaching longitude 120° E. The different types in groups 1 and 4 are not homogeneous. Doctor Doberck seems to have devised his classification, not from a general point of view, but with local forecasting in mind.

In Father Algué's book, The Cyclones of the Far East,[6] two classifications are outlined. It is to the second classification, a classification of cyclones by zones of formation and course of trajectory, that attention is here directed. It is the latter scheme which is actually employed by the author. There are eleven types, under three headings: (1) Typhoons formed in the Pacific; (2) typhoons formed in the China Sea; and (3) typhoons formed in the Sea of Sulu. There are nine types in the first group, while there is only one type in the second and one in the third group.

In the first group, the cyclones which form in the Pacific, Algué has made use of the longitude and latitude of Manila as the dividing lines between the different subclasses. This method is a perfectly feasible one in the case of the typhoons of the Philippine Islands. But when its use is extended to the typhoons of Japan, it at once loses its significance and causes confusion. Thus, in type 3, under the heading of "cyclones formed in the Pacific which recurved toward Japan near the meridian of Manila," we have typhoons that mainly affect Korea, China, and the Philippines.[7] Many of these can not have the slightest influence on Japan.

As a whole, therefore, while the Algué classification may be excellent for forecasting purposes in the Philippines, it lacks the simplicity which would make it suitable for general use.

THE NEW CLASSIFICATION

It is apparent that there is need of a new classification which shall be both simple and definite. The following plan seems to satisfy the above requirements and to have distinct advantages over the older classifications. We have divided the typhoons into six main groups, namely, (1) typhoons of China, (2) typhoons of Japan, (3) typhoons of Indo-China, (4) typhoons of the Philippine Islands, (5) typhoons of the Pacific, (6) typhoons of the China Sea.[8]

Each group, with the exception of the last, is subdivided into four types, a, b, c, and d. Storms of group 6 include the typhoons of the China Sea originating either in the Pacific or in the China Sea, and filling up in the China Sea without in the meantime reaching the continent, or crossing the Philippine Islands. Storms of this kind occur very rarely, and hence any subdivision is unnecessary. The new classification is as follows:

I. Typhoons of China:
  - 1a. Typhoons of Central and of North China, originating in the Pacific, and passing inland on the Chinese coast north of Wenchow or latitude 28° N.
  - 1b. Typhoons of South China, originating in the Pacific, passing inland on the Chinese coast south of Wenchow, or latitude 28° N.
  - 1c. Typhoons of South China, originating in the Pacific, crossing the Philippine Islands before reaching China.
  - 1d. Typhoons of South China, originating in the China Sea.

II. Typhoons of Japan:
  - 2a. Typhoons of Japan, originating in the Pacific.
  - 2b. Typhoons of Korea, originating in the Pacific.
  - 2c. Typhoons of Japan originating in the Pacific and crossing the Philippine Islands before reaching Japan.
  - 2d. Typhoons of Japan originating in the China Sea.

III. Typhoons of Indo-China:
  - 3a. Typhoons of Indo-China originating in the Pacific and passing through the Bashi or the Balintang Channel before reaching their destination.

[6] Loc. cit. 1904, pp. 89-93.

[7] Loc cit., plate 19.

[8] "China Sea" is an unfortunate term, as the name of a nation is seldom used as an adjective to qualify another noun. Furthermore, the term is ambiguous when its plural "China Seas" is used to designate the bodies of water that are adjacent to China, i.e., the South Sea, the Eastern Sea, and the Yellow Sea. The translator of Bergholz's article on typhoons in the MONTHLY WEATHER REVIEW of September, 1899, 27: 40, has employed the term "China Sea" in its plural sense. This is a misnomer. The term "China Sea" has, however, been so frequently used and so generally recognized to mean that part of the Pacific Ocean which is included between China, Indo-China, Formosa, Borneo, and the Philippine Islands, that an alteration in the nomenclature does not seem advisable.

III. Typhoons of Indo-China—Continued.
- 3b. Typhoons of the Gulf of Tonking, originating in the Pacific, and crossing the Philippine Islands before reaching the Gulf of Tonking.
- 3c. Typhoons of Annam, originating in the Pacific and crossing the Philippines before reaching Annam.
- 3d. Typhoons of Indo-China, originating in the China Sea.

IV. Typhoons of the Philippines:
- 4a. Typhoons of Luzon, originating in the Pacific, crossing Luzon, and filling up in the China Sea without recurving to enter the Pacific.
- 4b. Typhoons of the Visayas and Mindanao, originating in the Pacific, crossing either Visayas, or Mindanao, or both, and filling up in the China Sea without recurving to enter the Pacific.
- 4c. Typhoons of the Philippines, originating in the Pacific, crossing the Philippine Islands, recurving, and either recrossing the islands, or passing into the Pacific through the Balintang Channel or the Formosa Channel.
- 4d. Typhoons of the Philippines, originating in the China Sea.

V. Typhoons of the Pacific:
- 5a. Typhoons of the Pacific, recurving east of longitude 130° E.
- 5b. Typhoons of the Pacific, recurving west of longitude 130° E., passing over the Loochoo Islands without, however, touching the continent, the Philippines, or the Japanese Islands.
- 5c. Typhoons of the Pacific, limited to the region south of latitude 20° N., and passing near the Philippines.
- 5d. Typhoons of the Pacific originating in the China Sea.

VI. Typhoons of the China Sea:
- 6a. Typhoons of the China Sea, originating in the Pacific or in the China Sea, and filling up in the China Sea without in the meantime passing over the Philippines.

The above plan in the main follows Father Chevalier's classification, but greatly amplifies it. Three new groups, besides the original three (i. e., the typhoons of China, Japan, and Indo-China) have been added, and each group with the exception of the last has been subdivided into four types. The new classification also has some similarities to that of Doberck. Thus Doberck's group 2 corresponds roughly to group 1 of the present scheme, comprising most of the typhoons of China. Doberck's group 3 includes all the typhoons of Japan and the Pacific, and hence embraces groups 2 and 5 of the present scheme. Groups 1 and 4 of the Doberck classification do not correspond to any division of the new scheme.

Father Algué has adopted a method which is just the reverse of that used in the present scheme, for he uses the name of the place of origin as the main heading, and subdivides each group according to the path of the storm. In the present classification, the name of the place of destination is made the main heading, and each group is subdivided according to the origin of the storm.

There are a few points in the new classification to which attention should be directed. In the first place, each numeral and letter is given a definite meaning. The definition of the numerals is quite obvious. The letters "a" and "b" designate those typhoons of the group which have their origin in the Pacific. The letter "c" means those which originate in the Pacific and subsequently cross or pass near the Philippines before reaching their destination or filling up in the Pacific. The letter "d" designates those typhoons which originate in the China Sea. This scheme of subdivision is deemed necessary in order to make the classification clearer and more practical.

In the second place, the use of names has been so restricted that all the typhoons in, for instance, group 1, actually pass inland over the Chinese coast and do not merely approach or pass near it. It is true that storms often influence the weather elements of a place without actually passing over that place. If, however, the geographical description of each of the new groups were considered to include all such cases, much confusion would result. This is more or less the case with Father Chevalier's classification.

Lastly, the present classification rests upon broad general considerations, and does not concern itself with the immediate problem of forecasting the typhoons of any particular region, as is the case with the classifications of Father Algué and of Doberck.

THE DISTRIBUTION AND CHARACTERISTICS OF EACH TYPE OF TYPHOON

One test of the flexibility of any classification of typhoons is the facility with which the different types of storms can be reclassified from different standpoints. The present classification is based upon the origin and the tracks of the storms. It will be seen that the storms of each group occur only within certain months, and that the different types differ in their seasonal distribution.

The following tables include 247 typhoons, observed during the period 1904–1915. From Table 3 it is seen that the storms of groups 1 and 2 occurred chiefly in the months July to September, inclusive. Among the 54 typhoons of group 1, only 1 occurred as late as the beginning of November, and 4 each came in the months of June and October. The remainder, 45 in all, i. e., approximate 84 per cent of the total, occurred in the months of July, August, and September. The seasonal distribution of the storms of group 2 is almost identical with that of group 1; 75 per cent of the total came in the months of July, August, and September: 5 per cent in May, and 10 per cent each in June and October. The maximum number of storms occurred in August, when 23 were registered. This embraces about two-fifths of all the storms in the group.

The typhoons of group 3 occurred later in the season. More than half of them appeared in the months of September and October, while July and November had six each, and August, four. Under the heading "Typhoons that cross the Philippine Islands," all the storms of group 4 are included, besides those of types 1c, 2c, and 3c. These storms occurred in every month of the year except February. The maximum number was recorded in the months of October and November.[9] Besides the minimum in February, there is a secondary minumum in August, the reason for which will be explained later. Typhoons of group 5 occurred in every month, the maximum being in October.

TABLE 3.—*Seasonal distribution of different group of typhoons*

Typhoons	January	February	March	April	May	June	July	August	September	October	November	December	Total
Of China					0	4	17	13	15	4	1		54
Of Japan					3	6	9	23	11	6			58
Of Indo-China				1		1	6	4	12	11	6	1	42
Of the Philippines	1		1	2	3		2	1		3	5	6	24
Of the Pacific Ocean	2(?)	1	5	1	5	2	5	10	7	12	9	8	67
Of the China Sea									1		1		2
Originating in the China Sea	1(?)				3	3	6	5	5	1		1(?)	25
Which crossed Luzon				2	3	3	8	2	11	10	5	2	46
That crossed Mindanao or Visayas	1	0	1	2	1	1	1	2	2	4	9	5	29
Which crossed the Philippines	1	0	1	3	3	3	9	4	12	13	13	7	69

[9] Compare with table given in J. Coronas The Climate and Weather of the Philippines, 1903–1918, pp. 181–185.

TABLE 4.—*Seasonal distribution of different types of typhoons*

Type	January	February	March	April	May	June	July	August	September	October	November	December	Total
1a							2	1					3
1b						2	9	8	9				28
1c						2	4	1	4	4	1		16
1d							2	3	2				7
2a					3	5	5	17	9	6			45
2b							3	5	1				9
2c									1				1
2d						1	1	1					3
3a									3	3			6
3b						1	3	2	5	2	1		14
3c				1					2	5	5	1	14
3d							3	2	2	1			8
4a				1	1		1	1		1		1	6
4b	1		1				1			1	3	3	10
4c				1	2					1	2	2	8
4d													0
5a			4	1	1		2	6	6	10	8	4	42
5b	1?	1?					2	4	1	1	1		11
5c			1		1		1			1		3	7
5d	1?				3	2						1?	7
6a									1	1			2
Total	3	1	6	4	11	13	39	51	46	37	21	15	247
Per cent	1.2	0.4	2.4	1.6	4.4	5.2	15.8	20.6	18.6	14.9	8.4	6.0	

All the storms originating in the China Sea have also been grouped together. These are found to have a seasonal distribution similar to that of groups 1 and 2, that is, they occurred mostly in the months July, August, and September. There was one storm in each of the months of January and December. The fact that they originated in so high a latitude,[10] and so late in the season, makes it doubtful whether they were really tropical storms. It is also interesting to note that of 247 storms, only 25, or 10 per cent, originated in the China Sea.

If we examine each group more closely it will be found that the types in the same group differ in their seasonal distribution. Thus, in group 1, storms of types 1b and 1c both have their destination in South China. No typhoons in type 1b occurred later than the end of September, while among the storms of type 1c four occurred in October, and one in November, showing that all the storms which traveled to South China late in the season had first passed the Philippine Islands. Storms of type 1a, or typhoons of Central China, and those of type 2b, or typhoons of Korea, practically all occurred in the months of July and August. Typhoons of type 2a, however, had a longer season, extending from May to October. There is only one storm of type 2c, and that occurred in the month of September, although, according to Father Algué's charts,[11] typhoons of this type came mostly in the months of May and June. When we come to the discussion of the composite tracks of the months of May and June for the typhoons of 1904–1915, it will be seen that the most frequent tracks there shown are similar to that of the typhoons of this type.

In group 3, it should be noted that the storms of type 3a occurred only in the months of September and October. They would probably have gone inland in South China were it not for the fact that the anticyclone in Siberia had already begun to increase in intensity, and forced these storms westward or even southwestward into the China Sea.

This effect of the Siberian high-pressure area was observed by Doberck in 1898. He stated in his Law of Storms in the Eastern Sea (p. 14), that as long as the southwest monsoon is strong, the typhoons move in some northerly direction. It is only late in the year when the northeast monsoon happens to blow very fresh that typhoons move southwestward in the China Sea.

There is good reason to believe that Doberck's view is correct. An inspection of the Pilot Charts of the North Pacific, published by the United States Hydrographic Office, will show that while in the month of August southwest and northeast winds are equally prevalent in the region of the Formosa Channel, each having 18 per cent of the total frequency, in the months of September and October the northeast wind predominates, with 63 per cent in the latter and 40 per cent in the former month. Following Doberck's view, it is this prevalence of the northeast wind that prevents many of the typhoons of the Pacific from reaching the Chinese coast and causes them to go to Indo-China in the months of September and October.

The storms of type 3c which cross the Philippine Islands and reach Annam naturally come later in the season than those of 3b, which cross the Philippines and reach the Gulf of Tonking, as shown in Table 4. For, as the season advances, the growing anticyclones in Siberia displace the typhoon tracks further to the south. The maximum of the storms of type 3b occurred in September, while the storms of type 3c were most numerous in the months of October and November.

The storms of type 4a and 4b can not be discussed separately from those storms which cross the Philippines and subsequently go to the continent or to the Japanese Islands. For all these storms affect the Philippines just as much as do those of types 4a and 4b. Typhoons cross Luzon in any month from April to December, although the number of storms in the months of April, May, June, and December was small. According to the Bulletin of the Philippine Weather Bureau for December, 1915, only five typhoons have been observed to pass over Luzon in that month during the 35 years ending with December of the year 1915. It is also to be noted that during the height of the typhoon season, i. e., in the month of August, there was a decided minimum (see Table 3).

Typhoons that passed over Mindanao and Visayas were well distributed through the year, but most of them came late in the season, from October to December, with a maximum in the month of November. One case particularly worthy of mention is the typhoon of January 8–12, 1907. This was a violent typhoon of the first order, and entered Mindanao north of latitude 10° N. According to the Manila report, such a case is of rare occurrence.

Storms of type 4c cross the Philippines, recurve in the China Sea, and either fill up in the China Sea or recross the Philippines and fill up in the Pacific. These come at the beginning or end of the typhoon season, in the months of May, June, November, and December. On account of the high pressure on the continent, they are obliged to recurve toward the northeast. Storms of this type crossed Luzon more frequently than they did Visayas or Mindanao; indeed, only two of the eight storms of this type went over Mindanao or Visayas. One case was observed in the month of May, 1913, when a storm coming from the Pacific passed over Visayas, recurved in the China Sea, and crossed Luzon to reenter the Pacific. According to the Bulletin of the Philippine Weather Bureau,[12] six cases of such storms have been observed in the month of May since 1890, although they seldom occurred in other months. A more remarkable case is the typhoon of December 5–10, 1911. This storm struck

[10] Storms seldom originated below latitude 15° N. in the China Sea.
[11] Algué: Loc. cit., plates 21 and 26.
[12] May, 1913, pp. 116–118.

northern Luzon and, immediately after it had passed over the island, recurved toward the Pacific, touching the extreme northern end of the same island, and taking an almost due eastward course. The anticyclone on the continent seems to have been influential in forcing the typhoon to pursue such a course.

Not a single case of a typhoon of type 4d has been observed. There was, however, at least one depression which was reported by the Manila Observatory to have originated in the China Sea, entered the Visayas and southern Luzon, recurved, and reentered the China Sea. This storm occurred in November 13–17, 1908. The storm track was so extraordinary that the Manila Observatory published eight weather maps in the Monthly Bulletin to show the successive positions of this typhoon.

The typhoons of types 5a and 5b occurred mainly in the months July to November, inclusive. They are similar to the typhoons of Japan and China, but recurved farther to the east, and in a lower latitude. Storms of the Pacific limited to low latitudes, or typhoons of the Marianas and Pelew Islands, occurred at the beginning or end of the season. It is sometimes a difficult problem to tell whether the storms of type 5d are tropical or extratropical storms, and it is likely that the two storms of this type recorded in the months of January and December are not typhoons at all. They have been retained in the table for the reason that the latitude of their origin, 18°–19° N. is too low for extratropical cyclones.

Storms of type 6a are very rare. Those which originate in the northern part of the China Sea usually move inland in South China or Indo-China or go to the Pacific, while those which originated in the Sulu (Jolo) Sea almost always passed over the Phillippines. Only two storms of type 6a were recorded during the period 1904–1915. Both occurred in the year 1904, the first in the month of September and the second in October. The place of the origin of the first storm was unknown, but it developed in the northern part of the China Sea. The second storm came from the Pacific, and passed south of Mindanao in so low a latitude that its influence was not felt above latitude 10° N.[13]. Later, the vortex was observed to pass between the island of Jolo (latitude 6° 3′ N.) and the Equator, probably not far from latitude 5° N., and thence emerged on the China Sea, probably to the north of Borneo. Besides these two storms there were several depressions of this type observed in the China and Sulu Seas.

It is believed that the above 21 types include any kind of typhoon that may occur. A possible exception is the type of storm that originates in the Pacific or in the China Sea, traverses the Gulf of Siam, and finds its way into the Bay of Bengal. Father Algué mentioned two such cases in The Cyclones of the Far East.[14] The present article, however, deals with typhoons only, and does not touch upon the cyclones of the Bay of Bengal. If such cases as those mentioned by Father Algué should arise they will be classified according to the path they take before entering the Bay of Bengal.

During the 12 years 1904–1915, only one storm, that of October 19–26, 1905, went as far as the Gulf of Siam.[15] Even this was a doubtful case, as the observations made on board the steamship *Pera* merely suggest that the typhoon might have reached the Gulf of Siam, making its way toward the Bay of Bengal. The first portion of the storm track resembles very much that of the Chittagong cyclone, October 15–25, 1897.[16]

[13] Loc. cit., Oct. 1914, pp. 324–325.
[14] Algué: Loc. cit., pp. 219–229.
[15] Monthly Bulletin of the Philippine Weather Bureau, Oct., 1905, pp. 478–479.
[16] Algué: Loc. cit., plate 54.

THE SEASONAL VARIATIONS OF TYPHOON TRACKS

Like the tropical cyclones of other regions, typhoons occur mostly in the late summer and early autumn. The average number of typhoons in a year, however, far exceeds the number of tropical cyclones observed in one season in other regions. According to von Hann [17] the average annual number of cyclones in the region of the West Indies is 5; in the Bay of Bengal, 2; in the South Pacific, 4; in the South Ocean, 9; and in the Far East region, from 19 to 21. Hence, the number of typhoons in each year is more than double the number of tropical cyclones in any other region. There is at least a reasonable basis for the belief that this difference is merely apparent and not real. The question obviously depends upon what is taken as constituting a *cyclone*, a *typhoon*, or a *hurricane*. As mentioned in the introduction, any line drawn between well-developed cyclones and mere depressions must necessarily be more or less arbitrary. In the absence of a definite and well-established standard for classifying tropical storms according to their intensity, it is natural enough that different writers and different observers should have varying standards and obtain different results in their grouping of tropical storms.

Let us take, for example, the tropical storms of the western Pacific during the period 1904–1915. If we apply the term typhoon to those storms that registered a wind velocity of Beaufort scale 12, the average number of typhoons per year is only 9. If, however, the term be extended to include all the well-developed storms, the average number increases to 20.5. If, again, all the cyclonic storms were counted, irrespective of their intensity or degree of development, the number would be 30 or more per year. The frequency of typhoons would be the same as that of the cyclones of the South Indian Ocean, provided only those storms were counted in which winds of hurricane force were recorded. Von Hann took the data with regard to the frequency of typhoons from the works of Algué and Doberck. Judging by the result given by those authorities (see Table 5) it is safe to say that they have included under the term typhoon cyclones of the second order—i. e., storms during which a wind force of Beaufort scale 6 or more was registered.

TABLE 5.—*Seasonal distribution of typhoons, in percentages*

Period	1880–1901[a]	1885–1897[b]	1904–1915	1904–1915	1893–1918[c]	1880–1920[d]
Number of years	22	13	12	12	26	41
January	2	0	1	3	5	4.0
February	0	0	0	1	3	1.9
March	1	0	2	3	3	2.3
April	2	2	2	1	2	2.6
May	5	4	4	4	5.5	5.1
June	9	10	5	4	5.5	6.1
July	16	19	16	14	14	15.4
August	17	18	21	22	15	16.0
September	19	23	19	21	18	18.3
October	14	13	14	17	16	14.4
November	11	9	9	7	8	8.6
December	5	2	6	3	5	5.2
Total number of storms	468	244	247	109	619	917
Number of storms each year	21.3	19	20.5	9	23.8	22.4

[a] Algué, Cyclones of the Far East, Manila, 1904, p. 86.
[b] Doberck, The Law of Storms in the Eastern Seas, Hongkong, 1898, p. 33.
[c] Louis Froc, Atlas of the Tracks of 620 Typhoons, Shanghai, 1920.
[d] S. S. Visher, "Notes on typhoons, with charts of normal and aberrant tracks," MONTHLY WEATHER REVIEW, Nov. 1922, 50: 584–589.

[17] J. Von Hann, "Lehrbuch der Meteorologie" 3d ed., Leipzig, 1915, p. 612.

Table 5 also shows the monthly distribution of typhoons observed during the period 1904–1915. The percentages under column 4 are based on typhoons of the first order alone, while those under column 5 are based upon typhoons of the first and second orders. As a whole, these figures agree well with the percentages as given by Froc, Doberck, and Algué. There is but one discrepancy worthy of note. According to Froc, Doberck, and Algué, the maximum number of storms occurs in the month of September, while according to the present computation it occurs in the month of August. This difference can be partly explained, at least in the case of

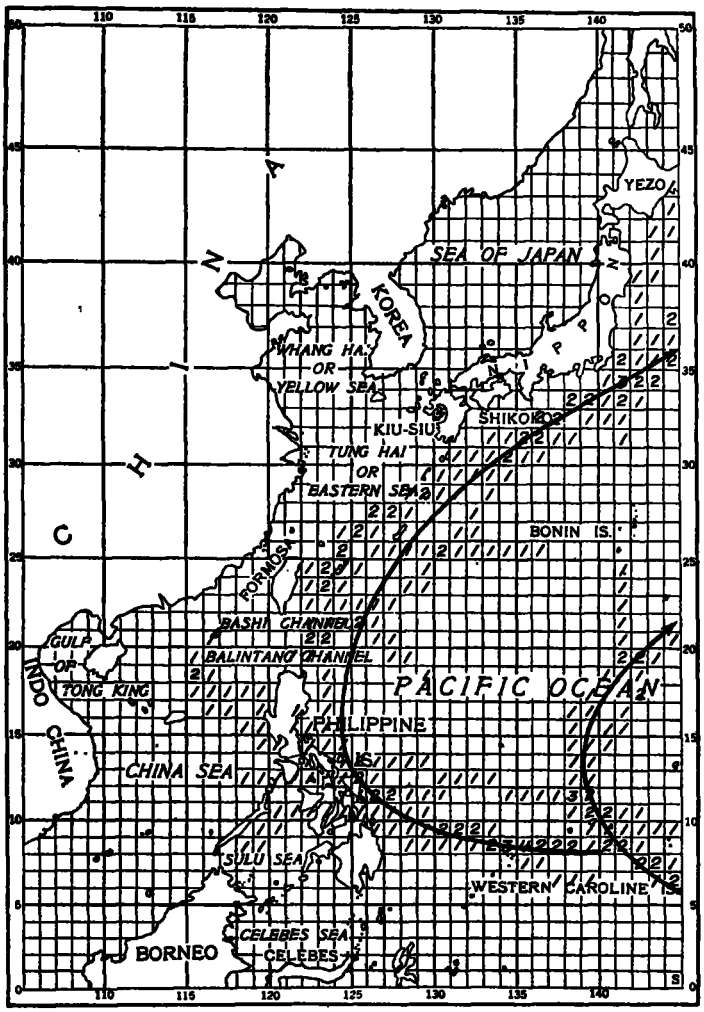

FIG. 1.—Composite tracks of 14 typhoons observed during the months January–April, 1904–1915

Father Algué's figures. We quote here his statement in The Cyclones of the Far East.[18] "In the first place we believe it will be of special interest and practical value to know something of the distribution of cyclones over the different months of the year, so as to find in what month they appear with greatest frequency and what months are free from them. For this purpose we have included those cyclones which have appeared in this archipelago, either crossing it or passing through it for a greater or less distance, and whose trajectory this observation has been able to discover." Thus we see that Father Algué based his result on the typhoons that cross the Philippine Islands, which, as Table 3 shows, have a decided minimum in the month of August, and on those which pass near by the islands. Most of the typhoons of Japan, especially those of type 2a, which do not approach the archipelago, have been omitted. These are, however, just the ones which occur most frequently in the month of August, as shown in Table 3.

The number or percentage of storms in each month, however, has not much significance unless we know the course or track which the cyclones generally pursue. For this purpose, Father Algué plotted the mean tracks of the typhoons of the Far East.[19] While the chart indicates the mean latitude and longitude of origin and of recurvature of typhoons in the different months, and also their average tracks, it does not show their frequency at a given place. Besides, the curves are often too broadly generalized. For instance, very few storms of a particular month will follow exactly the mean track of that month. On the other hand, if we plot all the storm tracks of a given period on one chart, as is sometimes done, the result usually becomes so confused that no satisfactory conclusion can be drawn. To obviate this difficulty, the following scheme has been adopted.

A map of eastern Asia and the western Pacific, on the Mercator projection, has been divided into squares, one degree longitude in width, and one degree latitude in length. Storm tracks of each month during the period of 1904–1915, plotted on maps of the same scale, were then traced on the cross section map, and each time a storm passed a certain square, a mark was made on that square. The total number in each square shows the number of storms that traversed that square during the given period.

Charts 1–7 were constructed according to this plan. Owing to the small number of storms in the months of January to April, inclusive, the tracks for those months were traced on one map. For the same reason the tracks of May and June and those of November and December were combined.

From charts 1–7 it is to be noted that during the first four months of the year the storms occurred mainly in the region limited by latitudes 5°–15° N., and longitudes 120°–140° E. A few reached higher latitudes, and traveled over the Loochoo group. The path of such storms was narrowly limited by the Siberian anticyclone on the one hand, and by the Pacific anticyclone on the other.[20] None of the cyclones approached the continent, and none crossed Japan, although a few passed over the Philippines. The composite storm tracks for the months of May and June are very striking. While maintaining the same general trend of path which characterized the typhoons of the first four months of the year, the May–June track is shifted a little to the northwest. Hence, a good many typhoons traversed the Japanese Islands, and a few reached southern China and the Gulf of Tonking, while the number of typhoons that occurred south of latitude 10° N. was comparatively small. The control exercised by the high-pressure area in the Pacific, over the Bonin Islands, is still much in evidence.

In the month of July the area covered by the storm tracks becomes much more extensive than in the preceding months. These tracks now extend still further to the north and west, until they reach the limits of the map in both directions. Most of the storms, however, are concentrated in latitudes 15°–30° N., and longitudes

[18] Algué: Loc. cit., p. 86.

[19] Algué: Loc. cit., see plate opposite, p. 146.

[20] For pressure distribution of eastern Asia in different months, see Louis Froc's Atlas of Tracks of 620 Typhoons.

115°–135° E. In the Pacific west of longitude 145°, and north of latitude 10° N., only the Bonin Islands and their immediate neighborhood are immune from typhoons, owing, no doubt, to the influence of the Pacific HIGH. The storm tracks begin to shift eastward in the month of August, so that no part of the Pacific west of longitude 145° E. and north of latitude 10° is then free of typhoons. Fewer storms reach the continent and, when they do, they do not penetrate as far as in July. In Japan, however, the reverse is true. More storms traversed these islands than during the preceding month. Attention is called to the fact that the island of Luzon was practically free from cyclones. In the Bashi and the Balintang channels, immediately north of Luzon, storms were very frequent.

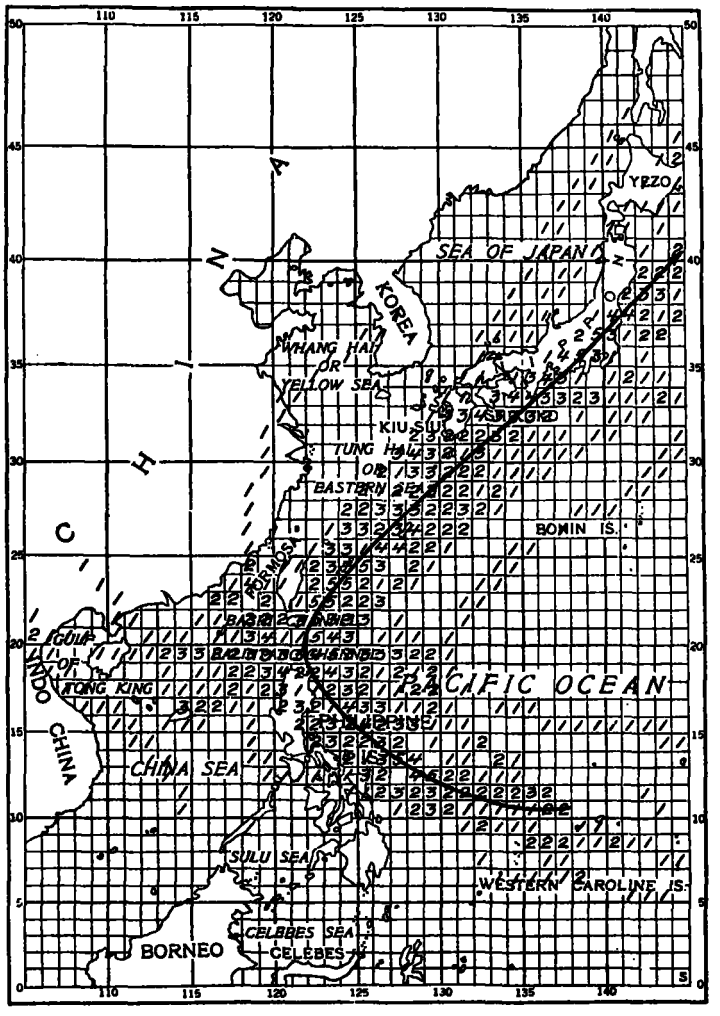

FIG. 2.—Composite tracks of 24 typhoons observed during the months May-June, 1904–1915

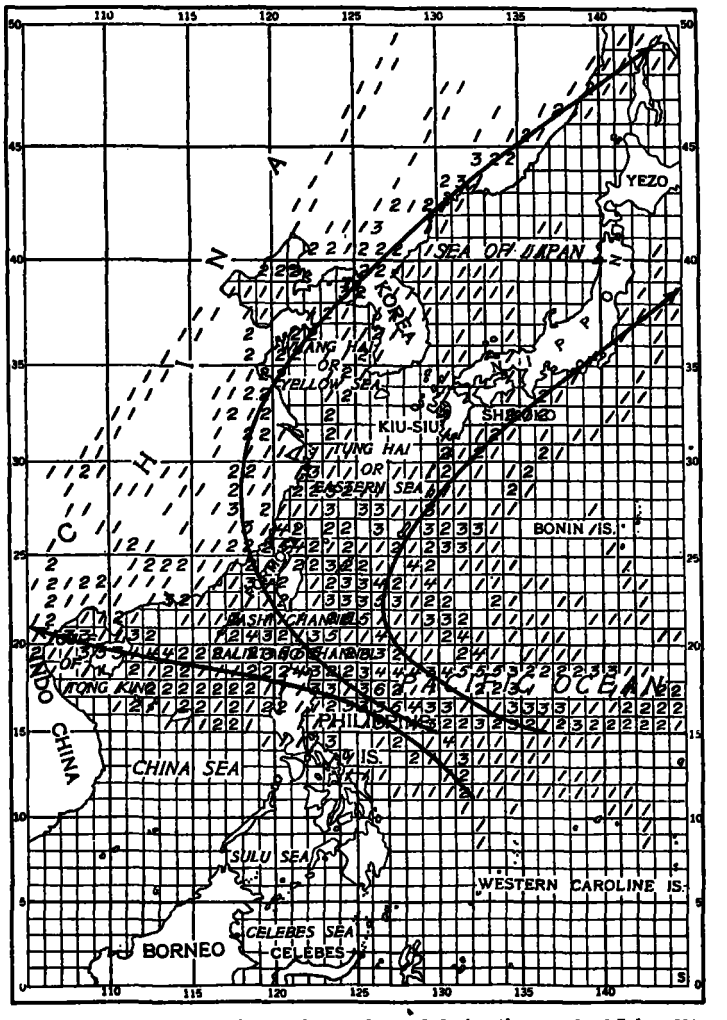

FIG. 3.—Composite tracks of 39 typhoons observed during the month of July, 1904–1915

Indeed, these channels seem to be the favorite highways of cyclones throughout the year.

In the month of September the storm path begins to shift southward, so that the frequency of cyclones south of latitude 15° N. increases considerably, while the number of cyclones occurring north of latitude 30° N. becomes comparatively few. There were more storms in the China Sea in this month than in any other month. The tendency of the storm tracks to be displaced southward and eastward, which begins in September, is still more marked in October. The majority of storms is concentrated in the region south of latitude 20° N. The island of Mindanao, and the part of the China Sea south of latitude 13°, which were not visited by the vortices of typhoons during the preceding months, are now frequented by them. No typhoons reach the Chinese coast north of latitude 25° N., although quite a few cross Japan. The typhoon tracks retreat still more to the southeast in the month of November and December, this fact being undoubtedly due to the advance of the continental anticyclones. The northern limit of the typhoon tracks in these two months approximates the isobar 762 millimeters (30 inches) which embraces Japan, the island of Formosa, and passes through Hainan. A considerable number of the typhoons traveled on a course south of latitude 15° N.

From the foregoing discussion, it will be evident that typhoon tracks are controlled by the four "centers of action" in the Far East, viz, the Siberian and the Pacific anticyclones, and the Aleutian and Indian cyclones. Of the two high-pressure areas, the Siberian anticyclone is the more effective. Not only is it far more intense than the Pacific HIGH, but the continent of Asia itself serves as an obstacle in the path of a moving typhoon. Even in summer, typhoons do not penetrate far into the continent, although the lowest pressure is to be found over the land at that season. Many storms find their way into the Aleutian LOW, but few, if any reach the Indian LOW, for they break up as soon as they go on shore on the coast of Indo-China.[21]

[21] For typhoon tracks also compare Algué: Loc. cit., chap. 8, pp. 78–83.

Among the different authorities who have touched upon the subject of monthly variation of typhoon tracks, Father Chevalier probably has stated it the most clearly. He says:[22] "I do not believe the trajectories of typhoons to be irregular; they are bound by laws, many of which are still unknown to us, but not a few can be established with some accuracy. To proceed more clearly in this determination, we have first to divide the typhoons into several classes. The first way of division is to classify them according to the time of their occurrence, into the typhoons of May, typhoons of June, typhoons of July, and so forth. And this way of classifying them, simple as it is, is not so bad for the present purpose. Indeed the periods of the year are the first principle on which apparently the variation of typhoon trajectories depends. "The trajectories of the typhoons of the different months are then described, beginning with the month of May, which, according to Father Chevalier, is the first month of the typhoon season. Father Chevalier divided the typhoon tracks of May and June into three classes: (1) those which originate northeast of the Philippines, recurving toward the Pacific; (2) those which originate nearer to the Philippines and travel westward or northwestward toward the Gulf of Tonking; and (3) those which originate in the Pacific, enter the northern part of the China Sea, recurve southeast of Formosa, and take a north or northeast course toward Japan. It is to be observed on the chart of the composite tracks for the months of May and June, that the storms of the third class predominate over the other types during the period 1904–1915.

With regard to the typhoons of July, August, and September, Father Chevalier says: "Though the season commences with May, typhoons are rare before July. With July they begin to be more frequent and also, generally, to reach the Chinese coast north of Hongkong instead of traveling toward the Tonking Gulf; and if the season be much advanced into August, there is more chance of their reaching a higher latitude. Hence they are seen to reach the estuary of the Yangtze River before the middle of July. The typhoons traveling thus toward the Chinese coast are those which during May and June traveled rather to the Tonking Gulf, namely, those which originate nearer to the Philippine Islands east or northeast of Luzon." We have seen in Table 4 that typhoons go to the Tonking Gulf most frequently in the months of September and October, but rarely in the months of May and June. It will also be seen later that the typhoons which go toward the Chinese coast i. e., those of types 1a and 1b, originate farther to the

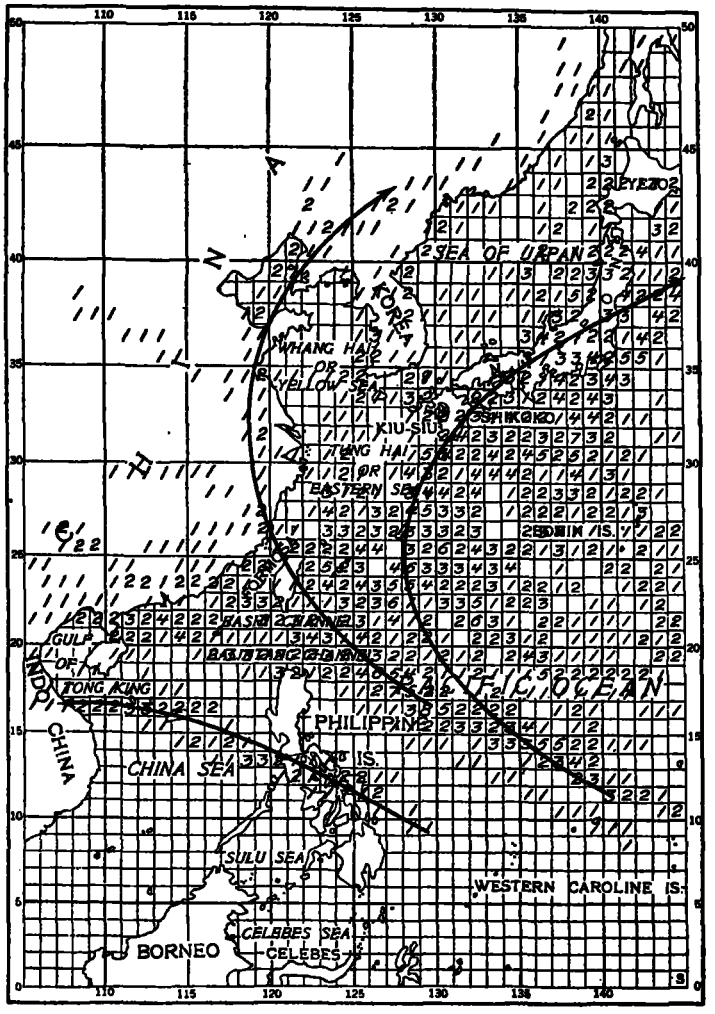

FIG. 4.—Composite tracks of 51 typhoons observed during the month of August, 1904–1915

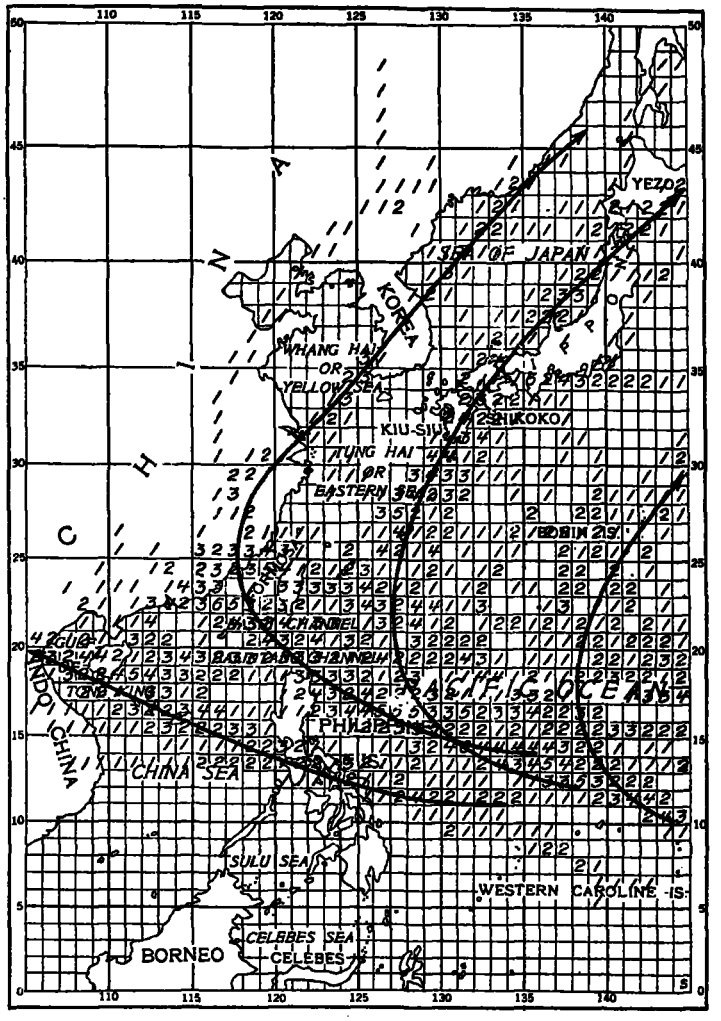

FIG. 5.—Composite tracks of 46 typhoons observed during the month of September, 1904–1915

[22] Chevalier, The Typhoons of the Year 1893, Shanghai, pp. 87-97.

east than do those which travel over Luzon toward the Gulf of Tonking, or those of type 3b. On the other hand the storms that pass through the Balintang Channel and travel westward or southwestward to the Gulf of Tonking or Annam, or those of type 3a, originate in the same region as the typhoons of type 1a and 1b. This proves that typhoons of types 1a and 1b and those of 3a belong to the same class, but owing to the high pressure over the continent toward the end of September or in October, the storms are obliged to travel westward or southwestward on reaching the Balintang Channel.

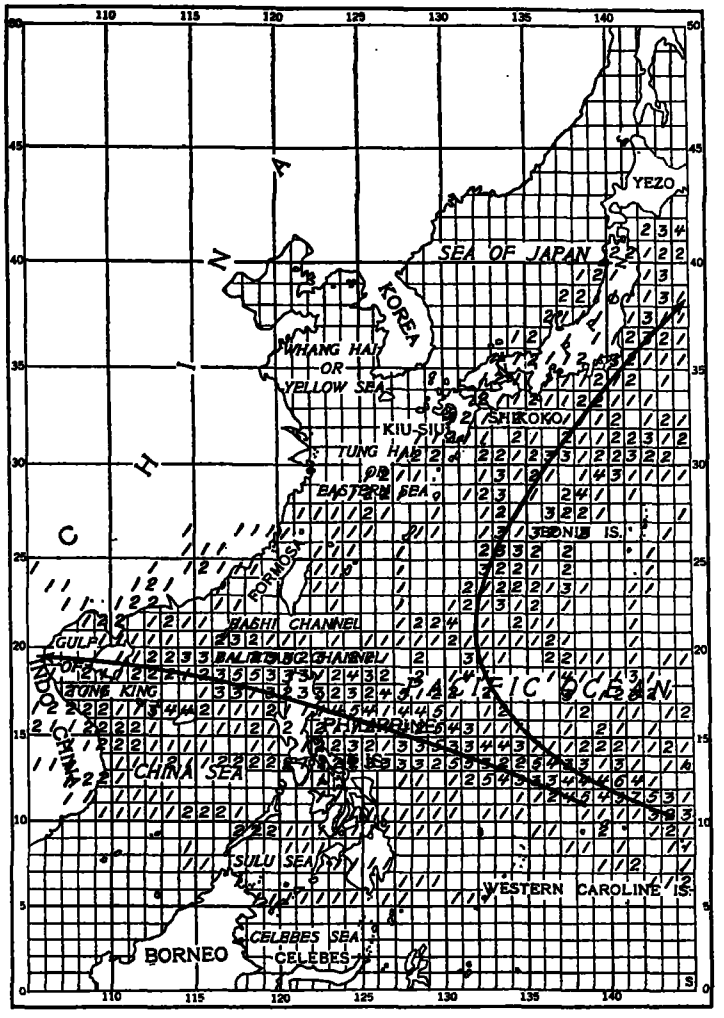

FIG. 6.—Composite tracks of 36 typhoons observed during the month of October, 1904–1915

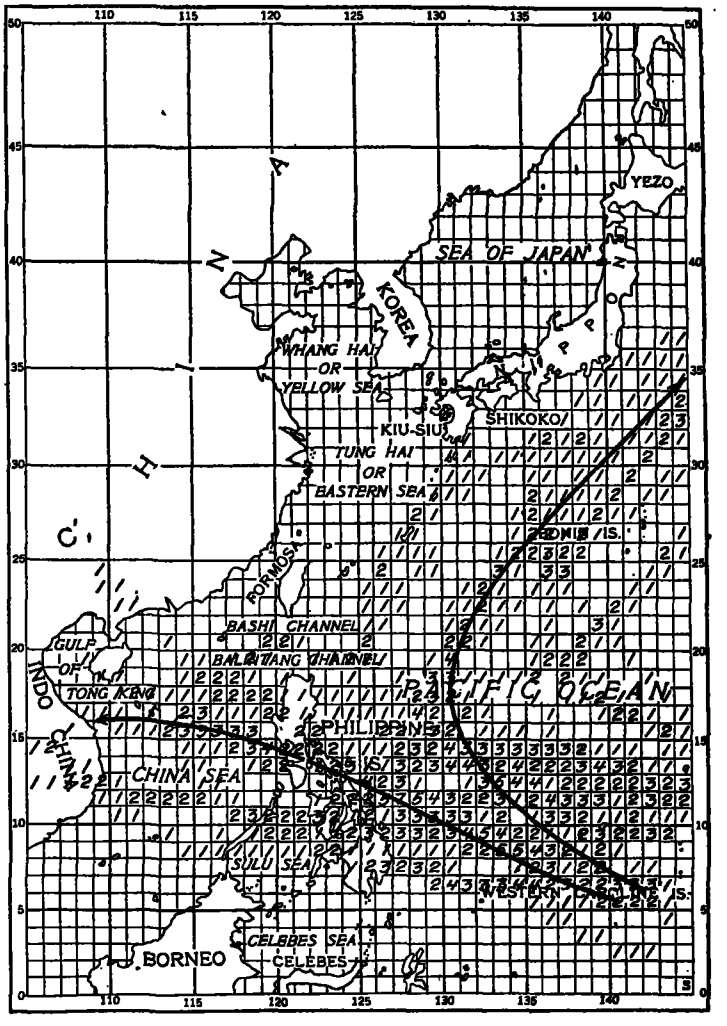

FIG. 7.—Composite tracks of 37 typhoons observed during the months November-December, 1904–1915

According to Father Chevalier, "From the middle of September the typhoons cease coming to Shanghai, but, they do not cease so soon to leave the Formosa Channel, especially the south of it. The more advanced October is, the freer is the north of the channel from typhoons, and the more surely do the typhoons move toward the Tonking Gulf, or recurve to a northeastward direction south of Formosa." The typhoons which recurve in a northeastward direction south of Formosa belong to type 4c, and as shown in Table 4 come in the months of April, May, October, November, and December.

Father Chevalier's statement with regard to the typhoons of November and December is as follows: "With November, the typhoons cease completely to rise to latitudes higher than 20°. Their formation takes place farther in the south, and the more the month of November is advanced, the farther south do they originate. This period of the year is the period of Annamese typhoons. The typhoons crossing the Philippine Islands generally traveled westward, and therefore go directly toward Annam, the farthest place they reach toward north is the Tonking Gulf. It is during this period that the abnormal southwest direction is sometimes observed." It is to be added that typhoons sometimes take a southwestward direction in the northern part of the China Sea, not only in the months of November and December, but also in October and even September.[23]

With the exception of a few minor discrepancies Father Chevalier's description of the typhoon tracks of the different months agrees remarkably well with the data given on charts 1–7.

[23] Louis Froc: Loc. cit., Shanghai, 1920, p. 1.

(To be concluded in the January, 1925, REVIEW)

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